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DESCRIPTION OF AND PHYLOGENETIC COMMENTS ON THE FINAL LARVAL INSTAR OF *CARYOBRUCHUS VESEYI* (HORN) (COLEOPTERA: BRUCHIDAE)

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Numerous species of the widely distributed and morphologically diverse genus *Caryobruchus* Bridwell have been studied (e.g., Bridwell, 1929; Pfaffenberger, 1974; Pfaffenberger and Johnson, 1976). This is not so for *C. veseyi* (Horn) which apparently is restricted to the range of *Erythea brandegeei* Purpus, its host. According to Bridwell (1929), this bruchid is found in western Mexico and the Cape region of Baja California.

Adults oviposit on the seed coat of drupaceous fruits and like other bruchid species, the ecluding larva bores into the underlying fruit to feed within the oil-rich endosperm (Bridwell, 1929). Available information seems to indicate that *C. veseyi* has a high degree of host specificity toward its geographically restricted host.

To date there has only been one published larval description within this genus (Pfaffenberger, 1974). Therefore, the foregoing description is deemed important because of the recent active interest in larval taxonomy and the subsequent support such information will lend to a reliable scheme of classification among the Bruchidae.

Gratitude is expressed to D. H. Kavanaugh for supplying the larval specimen which is deposited in the collection of the California Academy of Sciences.

Caryobruchus veseyi (Horn)

Body.—(See Fig. 1 in Pfaffenberger, 1977.) Width-depth 4–5 mm by 9 mm long; C-shaped, robust; greatest width-depth in meso-metathoracic segments tapering slightly toward anterior end; abdominal segments 1–5 smaller and subequal in size, segments 6–10 with distinct posterior taper, segment 10 minute and nearly obscured by segment 9; cuticle white to yellowish, without conspicuous pigmented or sclerotized areas, setae restricted primarily to thoracic and abdominal sternites (chaetotaxy similar to Fig. 1A in Pfaffenberger, 1974), tergal setae sparse, found primarily on plical crests of larger abdominal segments.

Head.—(See Figs. 3, 4 in Pfaffenberger, 1977.) Retractable, hypognathous,

dorso-ventrally flattened, invaginated portion of capsule tan in color, mouthparts heavily pigmented, particularly the mandibles.

Ocelli.—Absent.

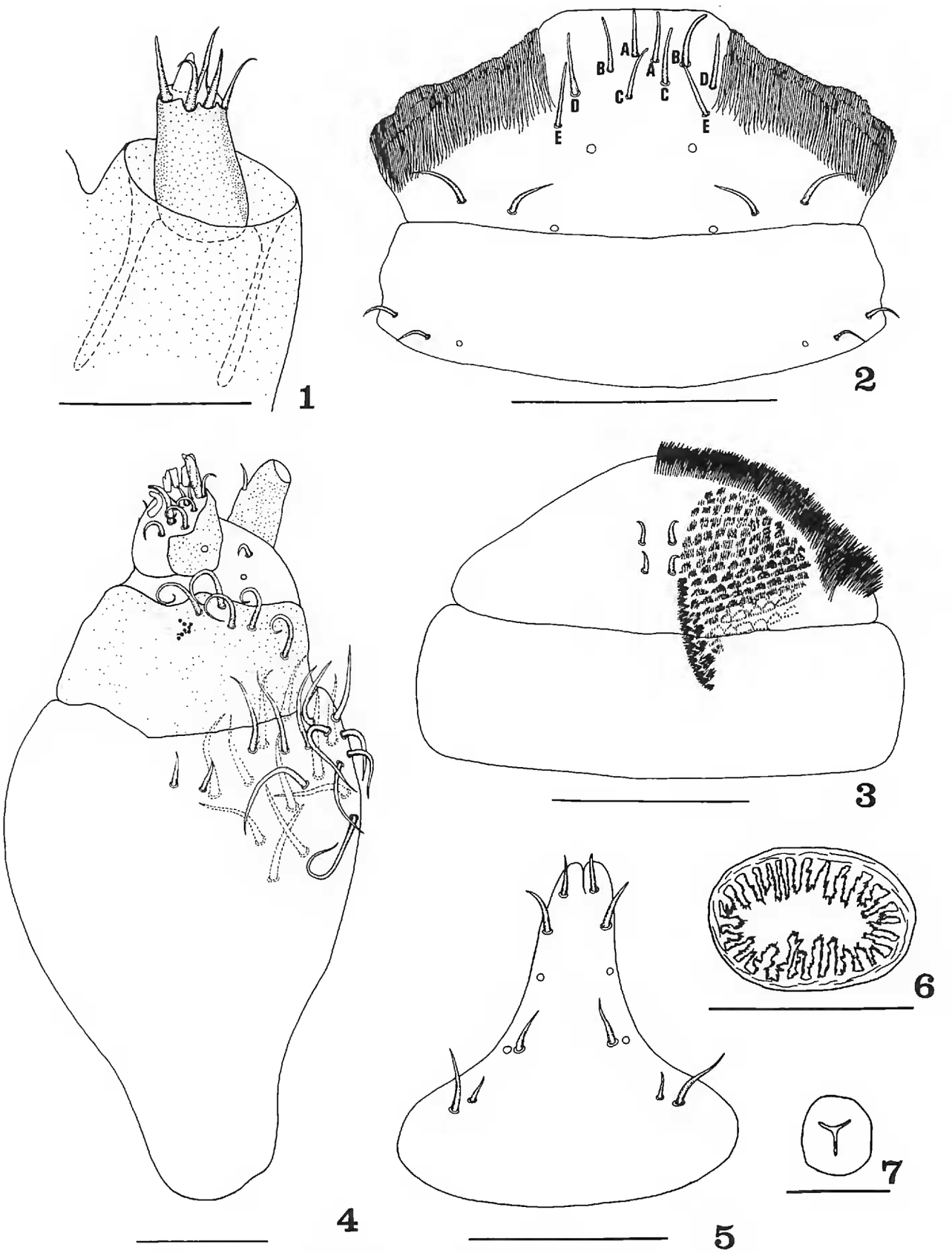
Antenna (Fig. 1).—Located at base of mandible near distal curvature of epicranial arm (Fig. 3 in Pfaffenberger, 1977); 2-segmented, frequently retracted into sclerotized antennal sheath, segments of subequal lengths, second segment narrower, with crenulated distal margin; 5 well-developed, sharp, stout, occasionally decurved, setae circumscribe distal, sensory cones; each setal base partially encircled by scallop in sclerotized, crenulated antennal margin; center of distal end occupied by 2 basiconic sensillae, median sensillum enlarged, 3–4 times larger than lateral sensillum, lateral sensillum with pointed, distal end.

Clypeolabrum (Fig. 2).—Clypeal portion 3 times as wide as long, with convex basal border; 2 setae and sensory pore aligned along proximolateral border, each spaced equidistantly by length of one seta, with sensory pore located medial most; labral portion with flat proximal border and arcuate distal border, distal margin concealed by several rows of elongated setal-like structures forming a brush border; 10 asymmetrically arranged setae partially obscured by brush border; setal pairs A, B, D, and E appear to form somewhat of an arc with setal pair C located near center of arc; pair of sensory pores located near proximolateral base of asymmetrically arranged setae; 2 additional pairs of setae and sensory pores located laterally along proximal border, all being equidistantly spaced by length of one of the setae, sensory pore proximomedial compared to setae.

Epipharynx (Fig. 3).—Distal border supporting dense, spinous mat which broadens laterally; 2 pairs of short, sharp, decurved setae located medially along lateral borders of epipharyngeal groove; between anterolateral spinous mat and medial, decurved setae is enlarged cluster of transversely aligned rows of spinous projections in mini-clusters, sclerotized projections more elongate and compact proximomedially, forming lateral borders for epipharyngeal groove.

Mandible.—(See Fig. 8 in Pfaffenberger, 1977.)

Maxilla (Fig. 4).—Cardo present (destroyed during preparation); stipes entirely membranous, bearing 24, well-developed setae on distal, medioventrolateral surface; sclerite of palpifer lightly sclerotized and bearing 5, strongly decurved, elongate setae on medioventral surface; near base of medial-most palpifer seta is small cluster (10) of apparent placoid-like sensillae; palpifer membrane bearing sensory pore and short, strongly decurved setae on distoventral surface; palpus single-segmented, bearing seta, midway between proximal and distal ends, on medial surface; lacinial sclerite, located ventrolaterally, bearing single, ventral sensory pore, 5 spatulate setae bordering distolateral surface, distoventral surface bordered by 3, equidistantly spaced, strongly decurved setae, distomedial area occupied by 5, transversely



Figs. 1–7. Final larval instar *Caryobruchus veseyi* (Horn), scale line 0.1 mm. Fig. 1. Antenna. Fig. 2. Clypeolabrum. Fig. 3. Epipharynx. Fig. 4. Left maxilla. Fig. 5. Labium. Fig. 6. Spiracle. Fig. 7. Anal sulcus.

arranged setae, boomerang-shaped, spatulate-like seta near dorsomedial border, 2 hair-like (possibly trichoid sensillae) setae on dorso-medial surface.

Labium (Fig. 5).—Entirely membranous; somewhat flattened proximally, with concave skewed, arch-like, distal taper; submentum fleshy, bearing pair of setae near each anterolateral border, anteromedial seta short, stout, half as long as other seta; lateral margin of mentum bordered basally by stout seta subtended by sensory pore, remainder of lateral margin bordered by (from proximal to distal end) equidistantly spaced sensory pore and 2 stout, sharp setae.

Leg.—(See Fig. 1H in Pfaffenberger, 1974.) Number of segments undetermined; without sclerotization.

Spiracle (Fig. 6).—Oval-shaped; uniforous; mesothoracic pair enlarged; atrial orifice nearly obscured by sclerotized, highly branched projections.

Anus (Fig. 7).—Y-shaped, terminal.

Host plants.—Erythea brandegeei Purpus.

Specimen examined.—One final instar (determined by association with adults collected from host plant). Collected along trail between "Tapon" and Rancho Poza Larga, 1100–1200 m, Arroyo de San Francisquito (from San Jorge to San Francisquito and La Chuparosa), east side Sierra de la Victoria, Baja California Sur, MEXICO, 13 April 1955 (Annetta Carter and Roxana S. Ferris, 3375).

Significant characters.—Small size; absence of ocelli; crenulated distal margin of second antennal segment; 5 setae circumscribing distal, antennal sensory cones; presence of 2 basiconic sensillae on antenna; absence of conspicuous sclerotized areas on clypeolabrum; brush-like border comprising several rows of elongate setae, found along distal margin of labrum; 5 pairs of asymmetrically arranged setae located anteromedially on labrum; enlarged, comma-shaped patch with transversely aligned rows of spinous projections on epipharynx; absence of sclerite on stipes; 24 well-developed setae on stipes; poorly sclerotized palpifer sclerite; presence of small cluster (10) of apparent placoid-like sensillae; 5 strongly decurved setae along distal margin of palpifer sclerite; single segmented palpus without visible sensory structures on distal end; 5 spatulate setae bordering distolateral surface of lacinia; 2 transverse rows of setae on distal end of lacinia; labium entirely membranous; labium tapered anteriorly with skewed, concave lateral margins; submentum indistinguishable from nonsclerotized mentum; labium bordered laterally with 5 setae and 2 sensory pores; atrial orifice of spiracle surrounded by rows of elongate, highly branched, sclerotized projections.

Discussion

According to Bridwell (1929), the genus *Caryobruchus* appears to consist of a deviant *C. veseyi* and two well defined species groups. The differences in arrangement, and/or presence/absence of chaetotaxy and particularly the

absence of ocelli in *C. veseyi* confirm his observations. Other major differences involve the extent of sclerotization as well as the number of sclerites. The latter may easily be interpreted on the basis of adaptation to seed hardness. For example, seeds of *Scheelea rostrata* Burret (host for *C. buscki*) and members of the genus *Sabal* (e.g., *S. minor* (Jacq.) Pers.; Woodruff, 1968) (host for *C. gleditsiae* (Linnaeus)) have a very hard seed whereas, the seed of *E. brandegeei* (host for *C. veseyi*) is relatively soft.

Increased seed hardness translates into a greater demand for musculature to enable the larva to penetrate and successfully excavate the seed endosperm. With increased musculature a commensurate need arises for enlarged and more numerous sclerotized bases (sclerites) of attachment for the muscles. Therefore, larvae occupying harder seeds should theoretically possess a greater sclerotized surface area than larval forms parasitizing seeds with softer endosperm and more fragile seed coats. Such an hypothesis derives support from comparative observations of *C. buscki* Bridwell (Pfaffenberger, 1974) and *C. veseyi*. To confirm this observation, however, would require a comparative examination of the first (see *C. gleditsiae*; Pfaffenberger and Johnson, 1976) and final larval instars of several larval species in addition to those mentioned herein.

The extreme differences in presence/absence and degree of sclerotization of the sclerites suggests the need for a review of the integrity of this divergent genus. Such a recommendation is particularly evident when one observes the presence of 3 pairs of ocelli in *C. buscki* and none in *C. veseyi*. Because of the comparatively low adaptability of ocelli, they have been of distinct importance in distinguishing genera (Prevett, 1971) and even subfamilies (Boving, 1929) among larval Bruchidae.

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